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A device for and a method of detecting a disease of the udder of an animal

BACKGROUND OF THE INVENTION AND PRIOR ART

The present invention refers to a device for detecting a disease of the udder of an animal, comprising means for appreciating, for each teat of said animal, a parameter related to the quantity of milk extracted from an actual teat during at least one milking operation. Moreover, the invention refers to a method of detecting a disease of the udder of an animal.

The present invention is concerned with udder inflammation of animals, i.e. mastitis, which may be caused by an infection of microorganisms, such as bacteria, but also be the result of a trauma or hormonal imbalances. In all milk production, mastitis constitutes a significant problem with respect to animal comfort, increased workload, reduced production capacity, etc.

In the past, different methods and devices have been proposed for identifying mastitis. Such methods and devices include, for instance, conductivity and temperature measurements on the milk extracted. Such measurements require a rather complicated equipment and the result thereof is still not very reliable. It is also known to identify mastitis by means of laboratory tests, which although reliable is rather inconvenient, since it might take many days before the result of such a test is received by the farmer.

Furthermore, it is known that one part of the udder of a cow, i.e. a quarter of the udder, may be inflamed by mastitis whereas the other quarters thereof are still healthy. Consequently, it is

important to be able to identify any inflammation on an individual teat basis, i.e. for each quarter udder.

US-A-4 325 028 discloses one example of a device for measuring the conductivity of the milk from each individual teat in a milk conduit between the teatcup and the claw in order to identify mastitis. The measurement equipment comprises a receiving device, provided in each such milk conduit and having electrodes located therein, and an electronic evaluation device. The constructions of the receiving devices are not described more closely. The aim of the device disclosed is to enable the determination whether the conductivity value of the milk from an individual teat is abnormal and thus whether any udder part is inflamed.

EP-B-137 367 discloses a milking device comprising measurement equipment for detecting the milk flow from an individual teat. The value detected may be employed for determining when the milking from this teat is to be interrupted. The measurement equipment comprises two electrodes for each milk flow to be detected.

US-A-5 116 119 discloses an apparatus for measuring the milk flow through a flow channel. By means of electromagnetic radiation, the momentary volume and the momentary velocity of the milk flowing through the channel may determined. Consequently, it is possible to determine the milk quantity of each milking operation.

SUMMARY OF THE INVENTION

The object of the present invention is to provide a device and a method for detecting a disease, in particular an inflammation, of an individual teat in a simple and reliable manner.

This object is obtained by the device initially defined and characterized by means provided to determine a deviation of said

parameter from a comparison value, and to display said deviation as an indication of an inflammation of the actual teat in the case that said deviation exceeds a certain level. It has appeared that a deviation in the quantity of milk produced by a teat in relation to a normal quantity may indicate mastitis in the udder and the particular teat from which the milk has been extracted. Consequently, by making use of this knowledge, in accordance with the present invention, it is possible to detect mastitis in an easy and convenient manner and thereby take appropriate measures at an early stage to prevent the disease from infecting further udder parts or animals.

According to an embodiment of the invention, the determining means is arranged to define said comparison value by the level of said parameter regarding the milking operation of at least one other teat of said animal. It has been found that if the milk quantity of one udder part deviates from the milk quantity of the other udder parts of one animal, there is high probability that the udder deviating is infected by mastitis. The quantity of milk from one udder normally forms a certain percentage of the total milk quantity from the udder. Any deviation, especially reduction, of said percentage may indicate mastitis in the actual teat or udder part. Moreover, said actual teat and said other teat may form one of a rearward pair of teats of the udder and the forward pair of teats of the udder. The milk yield from corresponding udder parts, e.g. from the two rear udder parts, is normally essentially equal whereas the milk yield from the rear udder parts is normally greater than the milk yield from the forward udder parts. Trials have shown that the difference in milk yield from a healthy udder part and an inflamed corresponding udder part might be 23%. By comparing corresponding udder parts in this manner, no historical data regarding previous milking operations are necessary for the indication of mastitis. Moreover, normal variations in the milk yield need not be considered according to this embodiment.

According to another embodiment of the present invention, the determining means is arranged to define said comparison value by the level of said parameter of at least one preceding milking operation of said animal. It is also possible to compare, for instance, the milk yield from different milking operations of one and the same teat or udder part. By collecting such historical data over a longer period of time, it is possible to determine a normal average parameter regarding the milk yield, which then may be employed as the comparison value defined. Preferably, the determining means is arranged to consider the time interval between the actual milking operation and the immediately preceding milking operation of said animal for determining said deviation. For instance, in voluntary milking systems, the time interval between successive milking operations may vary. In order to obtain a comparable value of said parameter, it is advantageous to take account of this time interval.

According to a further embodiment of the present invention, said parameter comprises the quantity of milk produced during one milking operation of a teat and that the appreciating means comprises a milk measuring device. In such a manner, a milk meter or any other liquid measuring device, such as any kind of liquid flow meter, may be employed for each teat or udder part for determining said parameter.

According to a further embodiment of the present invention, said parameter comprises the time duration of one milking operation of a teat and the appreciating means comprises a time measuring device. It is appreciated that the duration of the milking operation of one teat or udder part reflects the quantity of milk obtained during this milking operation. Consequently, by comparing the time duration of, for instance, the milking operation of two corresponding udder parts or between two successive milking operations of one teat or udder part, it is possible in an easy and convenient manner to detect an inflammation of an udder part.

The above object is also obtained by the method initially defined and comprising the steps of:
appreciating, for each teat of said animal, a parameter related to the quantity of milk extracted from an actual teat during a milking operation,
determining a deviation of said parameter from a comparison value, and
indicating an inflammation of the actual teat in the case that said deviation exceeds a certain level.

Advantageous embodiments of the method are defined in the dependent claims 10 to 16.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described more closely by means of various embodiments and with reference to the accompanying drawings, in which

Fig 1 shows a schematic view of a device according to the present invention, and

Fig 2 shows a part of a device according to the present invention.

DETAILED DESCRIPTION OF VARIOUS EMBODIMENTS OF THE PRESENT INVENTION

Fig 1 discloses a device for indicating mastitis in any of the teats or udder parts of an animal. The device according to the invention is connected to a milking machine, which may be of a conventional type and which is merely represented in the drawings by four teatcups 1, 2, 3 and 4 and four milk conduits 5 connecting each teatcup 1-4 to a milk-receiving member of the milking machine.

In the following it is referred to milking of a respective teat. However, by this expression is meant milking of a respective udder part, i.e. one of the two rear udder parts or one of the two front

udder parts. As an example, the teatcups 1, 4 may be intended for milking of the front udder parts where as the teatcups 2, 3 are intended for milking of the rear udder parts.

The device comprises a processing unit 6 provided to determine a deviation in a parameter related to the quantity of milk extracted from any of the four teats from a comparison value. The processing unit 6 is connected to or incorporates a display member 7. The display member 7 may be of a number of different types. For instance a screen, a number of indicating lamps or diodes, one for each teat, producing a light signal when a teat is inflamed, or any display disclosing the size of the deviation leaving to the farmer to conclude if the deviation indicates an inflammation or not. Furthermore, the processing unit 6 may be connected to or incorporate a time measuring unit 8 arranged to measure the duration of a milking operation of a teat and/or the time period between two successive milking operations of a teat.

Furthermore, the device according to the invention comprises appreciating means 9, one for each teatcup 1-4. The construction and function of the appreciating means 9 may vary according to different embodiments of the present invention. Fig 2 discloses an appreciating means 9 in the form of a milk measuring device comprising a container 10 arranged to collect the milk produced during one milking operation. The milk measuring device comprises a sensor 11 arranged to sense the quantity of milk collected during the milking operation and transfer the sensed quantity to the processing unit 6. When the processing unit 6 has registered the milk quantity, a valve 12 is opened in order to convey the milk collected to the milk-receiving member of the milking machine. It is to be noted that also other types of milk measuring devices may be employed when realising the present invention, for instance the liquid measuring device disclosed in US-A-5 116 119.

The appreciating means 9 may also be realised by a device merely arranged to indicate whether there is a milk flow or not. Such a device is for instance disclosed in EP-B-137 367 mentioned above. Thereby the time measuring unit 8 may be arranged to measure the duration of the milking period, i.e. the time interval from the beginning of the milk flow through the conduit 5 until the end of the milk flow. It is appreciated that the duration of the milking operation reflects the quantity of milk produced during said milking operation, i.e. the interval appreciated forms said parameter.

According to an embodiment of the present invention, the processing unit 6 is arranged to compare said parameter related to the quantity of milk from the two front teatcups 1, 4 or from the two rear teatcups 2, 3. In this case no time measuring unit 8 is necessary. Merely the fact that the quantity of milk form one of the front teats or the rear teats deviates from the other front teat and rear teat, respectively, is an indication that the actual teat may be inflamed by mastitis.

According to another embodiment of the present invention, the processing unit 6 is arranged to compare said parameter between the actual milking operation and at least one previous milking operation. A deviation in quantity in the actual milking operation is an indication that the teat may be inflamed by mastitis. In this embodiment the processing unit 6 comprises a memory 13 arranged to store historical data regarding said parameter of one or more previous milking operations for each teat. Preferably, an average value of said parameter of a great number of previous milking operations may be calculated by means of the processing unit 6. This average value may then be stored in the memory 13 as said comparison value.

It is also possible to define said parameter as the quantity of milk produced during a determined period of time by one teat of an animal, for instance during 24 hours, or by the total duration of

milking during a determined period of time, i.e. the total time period when milk is actually flowing from a teat during 24 hours.

The present invention is not limited to the embodiments described above but may be varied and modified within the scope of the following claims.

Claims

1. A device for detecting a disease of the udder of an animal, comprising means (9) for appreciating, for each teat of said animal, a parameter related to the quantity of milk extracted from an actual teat during at least one milking operation, characterized by means (6, 7) provided to determine a deviation of said parameter from a comparison value, and to display said deviation as an indication of an inflammation of the actual teat at least in the case that said deviation exceeds a certain level.

2. A device according to claim 1, characterized in that the determining means (6) is arranged to define said comparison value by the level of said parameter regarding the milking operation of at least one other teat of said animal.

3. A device according to claim 2, characterized in that said actual teat and said other teat form one of a rearward pair of teats of the udder and the forward pair of teats of the udder.

4. A device according to any one of the preceding claims, characterized in that the determining means (6) is arranged to define said comparison value by the level of said parameter of at least one preceding milking operation of said animal.

5. A device according to claim 4, characterized in that the determining means (6, 8) is arranged to consider the time interval between the actual milking operation and the immediately preceding milking operation of said animal for determining said deviation.

6. A device according to any one of the preceding claims, characterized in that said parameter comprises the quantity of milk produced during one milking operation of a teat and that the appreciating means (9) comprises a milk measuring device.

7. A device according to claim 6, characterized in that the milk measuring device (9) comprises a flow meter.

8. A device according to any one of the preceding claims, characterized in that said parameter comprises the time duration of one milking operation of a teat and that the appreciating means comprises a time measuring device (8).

9. A method of detecting a disease of the udder of an animal, comprising the steps of:
appreciating, for each teat of said animal, a parameter related to the quantity of milk extracted from an actual teat during at least one milking operation,
determining a deviation of said parameter from a comparison value, and
indicating an inflammation of the actual teat at least in the case that said deviation exceeds a certain level.

10. A method according to claim 9, characterized by the step of:
displaying said deviation as an indication of an inflammation of the actual teat in the case that said deviation exceeds a certain level.

11. A method according to any one of claims 9 and 10, characterized by the step of:
defining said comparison value by the level of said parameter regarding the milking operation of another teat of said animal.

12. A method according to claim 11, characterized in that said actual teat and said another teat form one of a rearward pair of teats of the udder and the forward pair of teats of the udder.

13. A method according to any one of claims 9 to 12, characterized by the step of:
defining said comparison value by the level of said parameter of at least one preceding milking operation of said animal.

14. A method according to claim 13, characterized by the step of: considering the time interval between the actual milking operation and the nearest preceding milking operation of said animal when determining said deviation.

15. A method according to any one of claims 9 to 14, characterized by the step of:
measuring the quantity of milk extracted from the actual teat during one milking operation.

16. A method according to any one of claims 9 to 15, characterized by the step of:
measuring the time duration of one milking operation of the actual teat.

Abstract

The invention refers to a device for and a method of detecting a disease of the udder of an animal. The device comprises means (9) for appreciating, for each teat of said animal, a parameter related to the quantity of milk extracted from an actual teat during at least one milking operation. Further means (6, 7) is provided to determine a deviation of said parameter from a comparison value, and to display said deviation as an indication of an inflammation of the actual teat in the case that said deviation exceeds a certain level.

(Fig 1)

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Fig 1

Fig 2